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PATENT APPLICATION

ATTORNEY DOCKET NO. 10010115-1

IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): Motamedi et al.

Serial No.: 10/033,201 **Examiner:** Alessandro Amari

Filing Date: 12/27/2001 **Group Art Unit:** 2872

Title: WIDE-BAND TUNABLE OPTICAL FILTER USING ELECTOHOLOGRAMS WRITTEN INOT PHOTOREFRACTIVE CRYSTALS

ASSISTANT COMMISSIONER FOR PATENTS
PO Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF

Sir:

Transmitted herewith in triplicate is the Appeal Brief in this application with respect to the Notice of Appeal filed on **03/30/2004**.

The fee for filing this Appeal Brief is (37 CFR 1.17(c)) $330.00.

(complete (a) or (b) as applicable)

The proceedings herein are for a patent application and the provisions of 37 CFR 1.136(a) apply.

( ) (a) Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)-(d) for the total number of months checked below:

( )	one month	$110.00
( )	two months	$420.00
( )	three months	$950.00
( )	four months	$1480.00

( ) The extension fee has already been filled in this application.

(X) (b) Applicant believes that no extension of term is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

Please charge to Deposit Account 50-1078 the sum of **$330.00**. At any time during the pendency of this application, please charge any fees required or credit any overpayment to Deposit Account 50-1078 pursuant to 37 CFR 1.25.

(X) A duplicate copy of this transmittal letter is enclosed.

(X) I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, PO Box 1450, Alexandria, VA 222313-1450.
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I hereby certify that this paper is being facsimile transmitted to the Patent and Trademark Office on the date shown below.
( ) Date of Facsimile:

Typed Name: **Mark A. Wilson**

Signature: Mark A. Wilson

Respectfully submitted,

Motamedi et al.

By Mark A. Wilson

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Attorney Docket No. 10010115-1 PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Applicant: Motamedi et al. Group Art Unit: 2872
Serial No. 10/033,201 Examiner: Alessandro Amari
Filed: December 27, 2001
For: WIDE-BAND TUNABLE OPTICAL FILTER USING ELECTROHOLOGRAMS WRITTEN INTO PHOTOREFRACTIVE CRYSTALS

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

BRIEF ON APPEAL

Sir:

This brief is in furtherance of Applicants' Notice of Appeal filed March 30, 2004, appealing the decision of the Examiner dated December 30, 2003 finally rejecting claims 1 – 6, 8, 27, and 28. A copy of the claims appears in the Appendix to this brief. This brief is transmitted in triplicate.

CERTIFICATE OF MAILING UNDER 37 C.F.R. 1.8

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as U.S. Express Mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

Date: May 25, 2004 Signed: Mark A. Wilson

Express Mail Label No. ER778522750US Typed Name: Mark A. Wilson

I. Real Party in Interest

The real party in interest in this appeal is Agilent Technologies, Inc., a Delaware Corporation, having a place of business at 395 Page Mill Road, Palo Alto, California 94303.

II. Related Appeals and Interferences

There are currently no related appeals or interference proceedings in progress that will directly affect, or be directly affected by, or have a bearing on the Board's decision in the present Appeal.

III. Status of Claims

Claims 1 – 26 were originally filed with the application. In the October 21, 2003 Amendment and Response to Office action, claims 15 – 26 were canceled, claims 27 – 31 were added, and claims 1 and 9 were amended. No claims have been amended, canceled, or added for purposes of this Appeal.

Claims 29 – 31 stand allowed while claims 7 and 9 – 14 are objected to.

Claims 1 – 6 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over De Vre et al. (U.S. Pat. No. 5,640,256, hereinafter De Vre) in view of Hamel et al. (U.S. Pat. No. 5,712,717, hereinafter Hamel).

Claims 27 and 28 are rejected under 35 U.S.C. 102(b) as being anticipated by De Vre.

This Appeal is made with regard to pending claims 1 – 6, 8, 27, and 28.

IV. Status of Amendments

There are no pending amendments.

V. Summary of the Invention

The claimed invention is a tunable optical filter. According to the invention, multiple electroholographic (EH) gratings (see Applicants' specification, Fig. 2, reference number 210) with different center wavelengths are utilized to create a tunable optical filter that can be tuned over a wide wavelength range. The EH gratings are connected such that an input optical signal (232) can pass through at least one of the EH gratings. The EH gratings are activated and tuned by electrode pairs (228) that are controlled through a voltage controller (230). The tunable optical filter is coarse tuned by activating the EH gratings having a wavelength range that includes the center wavelength that is to be filtered and fine tuned by adjusting the voltage that is applied across the activated EH gratings. Because the tunable optical filter is tuned simply by the application and adjustment of voltage across EH gratings, the tunable optical filter can be accurately controlled and is less susceptible to vibration and mechanical failure. In addition, because the filter utilizes multiple EH gratings with different center wavelengths, the bandwidth of the filter can be extended beyond the bandwidth of any single EH grating.

An embodiment of the tunable optical filter, as recited in claim 1, comprises a plurality of electroholographic (EH) gratings (210), the EH gratings being optically connected such that an input optical signal (232) can pass through at least one of the plurality of EH gratings, wherein the EH gratings are activated to filter the input optical signal in response to an applied voltage, the plurality of EH gratings including EH gratings with different center wavelengths and EH gratings with the same center wavelengths. (see Fig. 2 and paragraph [0039] of Applicants' specification) As recited in dependent claim 4, the EH gratings are tunable over a range of wavelengths in response to adjustments in the applied voltage. (see Fig. 6 and paragraph [0057] of Applicants' specification) As recited in dependent claim 5, the tunable wavelength ranges of said EH gratings combine to form a continuously tunable wavelength range. (see Fig. 6 and paragraph [0057] of Applicants' specification)

Another embodiment of the tunable optical filter, as recited in claim 27, comprises a plurality of EH gratings (210) with different center wavelengths (218, 220, 222), the EH gratings being optically connected such that an input optical

signal (232) can pass through at least one of the plurality of EH gratings, wherein the EH gratings are activated to filter the input optical signal in response to an applied voltage. Further, as recited in claim 27, the EH gratings are tunable over a range of wavelengths in response to adjustments in the applied voltage. (see Fig. 6 and paragraph [0057] of Applicants' specification) As recited in dependent claim 28, the tunable wavelength ranges of the EH gratings combine to form a continuously tunable wavelength range. (see Fig. 6 and paragraph [0057] of Applicants' specification)

VI. Issues

Whether claim 1 is obvious under 35 U.S.C. 103(a) over De Vre in view of Hamel.

Whether claims 27 and 28 are anticipated under 35 U.S.C. 102(b) by De Vre.

VII. Grouping of Claims for Each Contested Ground of Rejection

Regarding the rejection under 35 U.S.C. 103(a), claims 1 – 3, 6, and 8 stand or fall together. Regarding the rejection under 35 U.S.C. 102(b), claims 27 and 4 stand or fall together, and claims 28 and 5 stand or fall together. Reasons why the above-identified claim groups are believed to be separately patentable are explained in the Argument section.

VIII. Argument

A. Claim Rejections Under 35 U.S.C. 103

Claims 1 – 6 and 8 were rejected under 35 U.S.C. 103(a) as being unpatentable over De Vre in view of Hamel.

Claim 1

Claim 1 recites a tunable optical filter comprising:

> "a plurality of electroholographic (EH) gratings, said EH gratings being optically connected such that an input optical signal can pass through at least one of said plurality of EH gratings, wherein said EH gratings are activated to filter said input optical signal in response to an applied voltage, said plurality of EH gratings including EH gratings with different center wavelengths and EH gratings with the same center wavelengths." (emphasis added)

With regard to claim 1, the Examiner states "DeVre et al teaches (see Figures 1, 2, 7, 8, 13 and 14) a tunable optical filter or a method for filtering an optical signal comprising a plurality of electroholographic (EH) gratings (12) with different center wavelengths, said EH gratings being optically connected such that an input optical signal can pass through at least one of said plurality of EH gratings as shown in Figures 2, 7 and 8 wherein said EH gratings are activated to filter said input optical signal in response to an applied voltage as described in column 8, lines 60 – 67, column 9, lines 1 – 67, column 10, lines 1 – 16, and column 12, lines 4 – 63." The Examiner then admits that "[h]owever, in regard to claim 1, DeVre et al does not teach that said plurality of EH gratings including EH gratings with different center wavelengths and EH gratings with the same center wavelengths." The Examiner goes on to state that "Hamel et al teaches a plurality of gratings including gratings with different center wavelengths and gratings with the same center wavelengths as described in column 3, lines 14 – 21, column 5, lines 42 – 51 and column 6, lines 21 – 26. The Examiner then concludes that it would have been obvious to one having ordinary skill in the art at the time the invention was made "to have the plurality of gratings include gratings with different center wavelengths and gratings with the same center wavelengths as taught by Hamel et al for the filter of DeVre et al in order to

improve the rejection level of particular wavelengths over a more extensive spectral range." (emphasis added)

The Examiner has not presented any suggestion or motivation to modify or combine the cited references

Applicants assert that a *prima facie* case of obviousness has not been established with regard to claim 1 because the Examiner has not presented any suggestion or motivation, either in the references themselves, or in the knowledge generally available to one of ordinary skill in the art, to modify one of the references or to combine the reference teachings. In particular, the Final action does not identify a suggestion or motivation either in De Vre or Hamel or in the knowledge generally available to one of ordinary skill in the art, to combine De Vre with Hamel. The only support provided for the combination is the general statement "in order to improve the rejection level of particular wavelengths over a more extensive spectral range." Applicants respectfully point out that "[t]he examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness." [M.P.E.P. 2142] The above-identified general statement does not provide the requisite factual basis to support a *prima facie* case of obviousness.

Further, as stated in *Ex parte Clapp*, 227 USPQ 972, (Bd. Pat. App. & Inter. 1985) "[t]o support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references." The Examiner has not identified where the prior art references expressly or impliedly suggest the claimed invention nor has the Examiner presented a convincing line of reasoning as to why an artisan would have found the claimed invention obvious. As stated, above, *the only support* provided for the Examiner's suggested combination is the general statement "in order to improve the rejection level of particular wavelengths over a more extensive spectral range." This general statement does not identify where the prior references suggest the claimed invention nor provide a convincing line of reasoning to support a *prima facie* case of obviousness.

With the rejection of Claim 1, the Examiner has failed to provide the requisite factual basis and failed to establish the requisite motivation to support

the conclusion that it would have been obvious to one skilled in the art to combine De Vre with Hamel. The Examiner must cite art to support the rejection. Alternatively, if the Examiner is aware of facts within his personal knowledge that provide the requisite factual basis and establish the requisite motivation to support his conclusion that it would have been obvious to one skilled in the art to combine De Vre with Hamel, then the Examiner should have provided an affidavit in accordance with 37 C.F.R. 1.104(d)(2) as requested by the Applicants in the Response filed February 10, 2004.

B. Claim Rejections Under 35 U.S.C. 102

Claim 27

Claim 27 was formed by combining the limitations of claims 1 and 4 as filed. Claim 27 recites a tunable optical filter comprising:

> "a plurality of electroholographic (EH) gratings with different center wavelengths, said EH gratings being optically connected such that an input optical signal can pass through at least one of said plurality of EH gratings, wherein said EH gratings are activated to filter said input optical signal in response to an applied voltage;
>
> wherein said EH gratings are tunable over a range of wavelengths in response to adjustments in the applied voltage."

The Final action states that the claim element "wherein said EH gratings are tunable over a range of wavelengths in response to adjustments in the applied voltage" is disclosed by De Vre in column 9, lines 1 – 67 and column 10, lines 1 – 16."

De Vre does not disclose EH gratings that are tunable over a range of wavelengths in response to adjustments in the applied voltage

Applicants assert that claim 27 is not anticipated by De Vre because De Vre does not disclose EH gratings that are "tunable over a range of wavelengths in response to adjustments in the applied voltage." De Vre discloses EH gratings that are either turned "on" or "off" to filter light of a particular wavelength, not EH gratings that are tunable over a range of wavelengths. Specifically, Figs. 11 and 12 of De Vre depict a multiple wavelength filter 50 having three wavelength-specific EH gratings, 52A, 52B, and 52C that are turned either "on" or "off." As

shown in Fig. 12, a wavelength of light is filtered when the respective EH grating is "on" and no light is filtered when an EH grating is "off." A more detailed description of Figs. 11 and 12 of De Vre was provided in Applicant's October 21, 2003 response. Although De Vre discloses EH gratings that are turned either on or off, nowhere does De Vre disclose EH gratings that are "tunable over a range of wavelengths in response to adjustments in the applied voltage" as recited in claim 27.

In response to Applicants arguments of October 21, 2003, the Final action further points to column 10, lines 11 – 16 and column 13, lines 5 – 9 of De Vre as disclosing "wherein said EH gratings are tunable over a range of wavelengths in response to adjustments in the applied voltage." With regard to column 10, lines 11 – 16, De Vre discloses "a dynamic filter" and a "multiple-wavelength filter" in which "any number of grating layers 12 can be activated simultaneously." As stated above, the system disclosed by De Vre is simply a system in which EH gratings are turned either "on" or "off." De Vre does not disclose gratings that are "tunable over a range of wavelengths in response to adjustments in the applied voltage."

With regard to column 13, lines 5 – 9, De Vre discloses "the heaters required during the thermal fixing step may be integrated with the filter to facilitate reprogramming of Bragg wavelengths at any time." Applicants acknowledge that gratings can be reprogrammed using the heaters required during the thermal fixing step as disclosed by De Vre. However, De Vre does not disclose "wherein said EH gratings are tunable over a range of wavelengths in response to adjustments in the applied voltage" (emphasis added) as recited in claim 27. That is, De Vre discloses reprogramming of Bragg wavelengths using heaters while claim 27 recites gratings that are "tunable...in response to adjustments of the applied voltage." In sum, because De Vre does not disclose "wherein said EH gratings are tunable over a range of wavelengths in response to adjustments in the applied voltage," claim 27 is not anticipated by De Vre.

The above-provided remarks apply also to claim 4.

Claim 28

Claim 28 is dependent on claim 27. Claim 28 is the same as claim 5 and recites "wherein the tunable wavelength ranges of said EH gratings combine to form a continuously tunable wavelength range." (emphasis added) With regard to claim 28, the Final action states "De Vre et al discloses that the tunable wavelength ranges of said EH gratings combine to form a continuously tunable wavelength range as described in column 9, lines 1 – 67 and column 10, lines 1 – 16."

De Vre does not disclose tunable wavelength ranges of EH gratings that combine to form a continuously tunable wavelength range

Applicants assert that claim 28 is not anticipated by De Vre because De Vre does not disclose tunable wavelength ranges of EH gratings that "combine to form a continuously tunable wavelength range." De Vre discloses EH gratings having different center wavelengths (see col. 8, lines 26 – 30). The EH gratings having the different center wavelengths are turned either "on" or "off." The wavelength bands that are filtered by the activated EH gratings are separate and distinct from each other and do not form a continuously tunable wavelength range. Fig. 12 of De Vre clearly shows that specific non-continuous wavelength bands are filtered using the disclosed multiple wavelength filter. Nowhere does De Vre disclose "wherein the tunable wavelength ranges of said EH gratings combine to form a continuously tunable wavelength range" as recited in claim 28.

In response to Applicants arguments of October 21, 2003, the Final action further points to column 10, lines 11 – 16 and column 13, lines 5 – 9 as disclosing "wherein the tunable wavelength ranges of said EH gratings combine to form a continuously tunable wavelength range." The remarks provided above with regard to claim 27 apply also to claim 28.

The Final action also points to Figs. 10C and 10D as showing "that the filtering response is continuous over a range of wavelengths in that there is a Bragg selectivity response, which is uninterrupted (i.e., continuous) over the range shown." (Final action, page 9) Figs. 10C and 10D do not disclose "wherein the tunable wavelength ranges of said EH gratings combine to form a continuously tunable wavelength range" as recited in claim 28. Rather, Figs. 10C and 10D depict the selectivity response of particular Bragg gratings and as clearly shown, the selectivity responses are fixed at particular center wavelengths.

Nowhere does De Vre disclose that the responses of these filters are continuous in any way or "combine to form a continuously tunable wavelength range." Because De Vre does not disclose "wherein the tunable wavelength ranges of said EH gratings combine to form a continuously tunable wavelength range," claim 28 is not anticipated by De Vre.

The above-provided remarks apply also to claim 5.

SUMMARY

Because the Examiner does not identify a suggestion or motivation either in De Vre or Hamel or in the knowledge generally available to one of ordinary skill in the art to combine De Vre with Hamel, claim 1 is not obvious from De Vre in view of Hamel. Additionally, because De Vre does not disclose "wherein said EH gratings are tunable over a range of wavelengths in response to adjustments in the applied voltage" or "wherein the tunable wavelength ranges of said EH gratings combine to form a continuously tunable wavelength range" as recited in claims 27 and 28, respectively, claims 27 and 28 are not anticipated by De Vre.

For all the foregoing reasons, it is earnestly and respectfully requested that the Board of Patent Appeals and Interferences reverse the rejections of the Examiner regarding claims 1 – 6, 8, 27, and 28, so that this case may be allowed and pass to issue in a timely manner.

Respectfully submitted,

Date: May 25, 2004

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APPENDIX

1. A tunable optical filter comprising:

a plurality of electroholographic (EH) gratings, said EH gratings being optically connected such that an input optical signal can pass through at least one of said plurality of EH gratings, wherein said EH gratings are activated to filter said input optical signal in response to an applied voltage, said plurality of EH gratings including EH gratings with different center wavelengths and EH gratings with the same center wavelengths.

2. The tunable optical filter of claim 1 further including:

electrode pairs associated with said EH gratings for applying voltage across EH gratings of a desired center wavelength to activate said EH gratings with said desired center wavelength; and

a voltage controller associated with said electrode pairs for controlling the application of voltage across said EH gratings by the respective electrode pairs.

3. The tunable optical filter of claim 2 wherein EH gratings of the same center wavelength are controlled simultaneously by said voltage controller.

4. The tunable optical filter of claim 1 wherein said EH gratings are tunable over a range of wavelengths in response to adjustments in the applied voltage.

5. The tunable optical filter of claim 4 wherein the tunable wavelength ranges of said EH gratings combine to form a continuously tunable wavelength range.

6. The tunable optical filter of claim 1 wherein at least two of said EH gratings having different center wavelengths are optically connected such that an input signal can pass through said at least two EH gratings in series.

7. The tunable optical filter of claim 1 further including:

an input birefringent element, located in an optical path that is before said plurality of EH gratings, for splitting said input optical signal into first and second polarized beams having different polarization states before said input optical signal passes through said plurality of EH gratings;

wherein said plurality of EH gratings includes a first group of EH gratings having different center wavelengths that are optically connected such that said first polarized beam can pass through said first group of EH gratings and a second group of EH gratings having the same center wavelengths as said first group of EH gratings that are optically connected such that said second polarized beam can pass through said second group of EH gratings, said first and second polarized beams passing through the respective groups of EH gratings in parallel.

8. The tunable optical filter of claim 1 wherein said EH gratings are formed in photorefractive crystals.

9. The tunable optical filter of claim 1 wherein said plurality of EH gratings are formed as a chirped EH grating that can be activated at different center wavelengths by applying different voltages across said chirped EH grating.

10. The tunable optical filter of claim 1 further including:

an input birefringent element, located in an optical path that is before said plurality of EH gratings, for splitting said input optical signal into first and second polarized beams having different polarization states before said input optical signal passes through said plurality of EH gratings;

an input polarization rotator, located in an optical path that is between said input birefringent element and said plurality of EH gratings, for bringing said first and second polarized beams to the same polarization state;

an output birefringent element, located in an optical path that is after said plurality of EH gratings, for combining said first and second polarized beams into an output signal after said first and second polarized beams have passed through said plurality of EH gratings; and

an output polarization rotator, located in an optical path that is between said plurality of EH gratings and said output birefringent element, for bringing said first and second polarized beams to different polarization states.

11. The tunable optical filter of claim 10 wherein a first set of electroholographic filter elements (EFEs), which includes a first group of said EH gratings, are aligned to filter said first polarized beam and a second set of EFEs, which includes a second group of said EH gratings are aligned to filter said second polarized beam.

12. The tunable optical filter of claim 10 wherein said input polarization rotator includes a half-wave plate that rotates the polarization state of one of said first and second polarized beams by ninety degrees.

13. The tunable optical filter of claim 10 wherein said output polarization rotator includes a half-wave plate that rotates the polarization state of one of said first and second polarized beams by ninety degrees.

14. The tunable optical filter of claim 1 further including polarization rotators located between EH gratings that have the same center wavelength.

15. canceled

16. canceled

17. canceled

18. cancelled

19. canceled

20. canceled

21. canceled

22. canceled

23. canceled

24. canceled

25. canceled

26. canceled

27. A tunable optical filter comprising:

a plurality of electroholographic (EH) gratings with different center wavelengths, said EH gratings being optically connected such that an input optical signal can pass through at least one of said plurality of EH gratings, wherein said EH gratings are activated to filter said input optical signal in response to an applied voltage;

wherein said EH gratings are tunable over a range of wavelengths in response to adjustments in the applied voltage.

28. The tunable optical filter of claim 27 wherein the tunable wavelength ranges of said EH gratings combine to form a continuously tunable wavelength range.

29. A tunable optical filter comprising:

a plurality of electroholographic (EH) gratings, said EH gratings being optically connected such that an input optical signal can pass through at least one of said plurality of EH gratings, wherein said EH gratings are activated to filter said input optical signal in response to an applied voltage; and

an input birefringent element, located in an optical path that is before said plurality of EH gratings, for splitting said input optical signal into first and second polarized beams having different polarization states before said input optical signal passes through said plurality of EH gratings;

wherein said plurality of EH gratings includes a first group of EH gratings having different center wavelengths that are optically connected such that said first polarized beam can pass through said first group of EH gratings and a second group of EH gratings having the same center wavelengths as said first group of EH gratings that are optically connected such that said second polarized beam can pass through said second group of EH gratings, said first and second polarized beams passing through the respective groups of EH gratings in parallel.

30. A tunable optical filter comprising:

a plurality of electroholographic (EH) gratings with different center wavelengths, said EH gratings being optically connected such that an input optical signal can pass through at least one of said plurality of EH gratings, wherein said EH gratings are activated to filter said input optical signal in response to an applied voltage;

wherein said plurality of EH gratings are formed as a chirped EH grating that can be activated at different center wavelengths by applying different voltages across said chirped EH grating.

31. A tunable optical filter comprising:

a plurality of electroholographic (EH) gratings, said EH gratings being optically connected such that an input optical signal can pass through at least one of said plurality of EH gratings, wherein said EH gratings are activated to filter said input optical signal in response to an applied voltage, said plurality of EH gratings including EH gratings with different center wavelengths and EH gratings with the same center wavelengths; and

polarization rotators located between EH gratings that have the same center wavelength.